

RECEIVED
CENTRAL FAX CENTER

JUN 25 2007

IN THE CLAIMS

This listing of the claim will replace all prior versions and listings of claim in the present application.

Listing of Claims

1. (currently amended) A system comprising:

a first device;

a second device;

a plurality of paths connected between the first device and the second device; and

a third device which is connected to the first device,

wherein the first device transfers data to the second device using the plurality of paths at a predetermined ratio defining ~~a weighting of an amount of~~ communications to be allocated on each of ~~among~~ the plurality of paths relative to a total amount of communications on all of the paths so that communication loads ~~among~~ on each of the plurality of paths are balanced,

wherein the third device detects congestion of the plurality of paths and notifies the first device of the congestion,

wherein the first device changes the predetermined ratio ~~among of~~ each of the paths, thereby changing the ~~weighting of an amount of~~ communications to be allocated ~~among to each of~~ the plurality of paths, based on notification from said third device of the congestion on the plurality of paths,

wherein the first device transfers data to the second device using the plurality of paths according to the changed predetermined ratio,

wherein said first device and the second device are storage devices,

wherein the third device has information on the predetermined ratio and a change rate to be applied to the predetermined ratio to compute the changed predetermined ratio, when a change in the predetermined ratio is required,

wherein the third device, when congestion of the plurality of paths has been detected, computes the changed predetermined ratio among-on each of the paths based on the change rate, and sends information on the changed predetermined ratio to the first device, and

wherein the first device transfers data to the second device using the plurality of paths based on the changed predetermined ratio among-on each of the paths.

Claim 2 (canceled).

3. (currently amended) A system comprising:

a first device;

a second device;

a plurality of paths connected between the first device and the second device, the plurality of paths being external of each of the first and second devices; and

a third device which is connected to the first device,

wherein the first device transfers data to the second device using the plurality of paths at a predetermined ratio defining a weighting of an amount of communications to be allocated among-on each of the plurality of paths

relative to a total amount of communications on all of the paths so that
communication loads among on each of the plurality of paths are balanced,

wherein the third device detects congestion of the plurality of paths
and notifies the first device of the congestion,

wherein the first device changes the predetermined ratio among of
each of the paths, thereby changing the weighting of an amount of
communications to be allocated among to each of the plurality of paths, based
on notification from said third device of the congestion on the plurality of
paths,

wherein the first device transfers data to the second device using the
plurality of paths according to the changed predetermined ratio,

wherein the first device is a computer, and the second device is a
storage device,

wherein the third device has information on the predetermined ratio
and a change rate to be applied to the predetermined ratio to compute the
changed predetermined ratio when a change in the predetermined ratio is
required,

wherein the third device, when congestion of the plurality of paths has
been detected, computes the changed predetermined ratio among on each of
the paths based on the change rate, and sends information on the changed
predetermined ratio to the first device, and

wherein the first device transfers data to the second device using the
plurality of paths based on the changed predetermined ratio among on each
of the paths.

4. (original) A system according to claim 3, wherein each of the plurality of paths has a network device for connecting the first device and the second device,

wherein the third device is connected to the network device via a network, and

wherein the third device receives a notification of occurrence of congestion in the network device from the network device via the network.

5. (original) A system according to claim 4, wherein the notification is a notification based upon SNMP Trap.

6. (previously presented) A system according to claim 1, wherein each of the plurality of paths has a network device for connecting the first device and the second device,

wherein the third device is connected to the network device via a network, and

wherein third device receives information on a discarded packet in the network device from the network device via the network and judges congestion of the plurality of paths based on the information on the discarded packet.

7. (original) A system according to claim 6, wherein, in the case in which the number of discarded packets received from the network device is larger than the number of discarded packets received previously, the

third device judges that congestion has occurred in the plurality of paths having the network device.

Claim 8 (canceled).

9. (previously presented) A system according to claim 1, wherein when the third device detects recovery from congestion of the plurality of paths, computes the changed predetermined ratio among the paths based on the change rate, and sends information on the changed predetermined ratio among paths to the first device, and

wherein the first device transfers data to the second device using a plurality of paths based on the changed predetermined ratio among paths.

10. (currently amended) A system comprising:

a first device;

a second device; and

a plurality of paths connected between the first device and the second device,

wherein the first device transfers data to the second device using the plurality of paths at a predetermined ratio defining ~~a weighting of an amount of communications to be allocated among on each of the plurality of paths relative to a total amount of communications on all of the paths~~ so that communication loads ~~among on each of the plurality of paths~~ are balanced,

wherein the first device detects congestion of the plurality of paths,

wherein the first device changes the predetermined ratio ~~among-on~~
each of the paths, thereby changing the ~~weighting-of-an~~ amount of
communications to be allocated ~~among-on~~ each of the plurality of paths,
according to the detection of the congestion of the plurality of paths by the first
device,

wherein the first device transfers data to the second device using the
plurality of paths according to the changed predetermined ratio,

wherein the first device and the second device are storage devices,

wherein the first device has information on the predetermined ratio
and a change rate to be applied to the predetermined ratio to compute the
changed predetermined ratio when a change in the predetermined ratio is
required,

wherein the third device, when congestion of the plurality of paths has
been detected, and computes the changed predetermined ratio ~~among-on~~
each of the paths based on the change rate, and

wherein the first device transfers data to the second device using the
plurality of paths based on the changed predetermined ratio ~~among-on~~ each
of the paths.

Claim 11 (canceled).

12. (currently amended) A system comprising:

a first device;

a second device; and

a plurality of paths connected between the first device and the second device, the plurality of paths being external of each of the first and second devices,

wherein the first device transfers data to the second device using the plurality of paths at a predetermined ratio 1 defining ~~a weighting of an amount~~ of communications to be allocated ~~among on each of~~ the plurality of paths relative to a total amount of communications on all of the paths so that communication loads among the plurality of paths are balanced,

wherein the first device detects congestion of the plurality of paths,

wherein the first device changes the predetermined ratio ~~among on~~ each of the paths, thereby changing the ~~weighting of an amount of~~ communications to be allocated ~~among on each of~~ the plurality of paths, according to the detection of the congestion of the plurality of paths by the first device,

wherein the first device transfers data to the second device using the plurality of paths according to the changed predetermined ratio,

wherein the first device is a computer, and the second device is a storage device,

wherein the first device has information on the predetermined ratio and a change rate to be applied to the predetermined ratio to compute the changed predetermined ratio when a change in the predetermined ratio is required,

wherein the third device, when congestion of the plurality of paths has been detected, computes the changed predetermined ratio ~~among on each of~~ the paths based on the change rate, and

wherein the first device transfers data to the second device using the plurality of paths based on the changed predetermined ratio among on each of the paths.

13. (previously presented) A system according to claim 10, wherein each of the plurality of paths has a network device for connecting the first device and the second device, and

wherein the first device receives a notification of occurrence of congestion in the network device from the network device via the plurality of paths.

14. (original) A system according to claim 13, wherein the notification is a flag based upon ECN.

15. (original) A system according to claim 12, wherein, in the case in which a response is not returned from the second device for a predetermined period, the first device judges that congestion has occurred in the plurality of paths.

16. (original) A system according to claim 12, wherein, in the case in which an acknowledgement of the data sent to the second device has been received redundantly, the first device judges that congestion has occurred in the plurality of paths.

Claim 17 (canceled).

18. (previously presented) A system according to claim 10, wherein, when a data size, which can be sent to the plurality of paths in which the congestion has occurred, has exceeded a value set in advance after the congestion occurrence, the first device judges that the plurality of paths has recovered from the congestion.

19. (currently amended) A storage system comprising:
a control unit;
a disk device which is connected to the control unit; and
an interface which is connected to a network which is connected between said interface of said storage system and another storage system, wherein the interface is connected to said another storage system by a plurality of paths in the network,
wherein the control unit sends data stored in the disk device as a packet to said another storage system using the plurality of paths at a predetermined ratio defining a weighting of an amount of communications to be allocated among-on each of the plurality of paths relative to a total amount of communications on all of the paths so that communication loads among the plurality of paths are balanced,
wherein, in the case in which an acknowledgement for the packet sent to said another storage system has not been received for a fixed period, the control unit judges that congestion has occurred in the plurality of paths,
wherein the control unit changes the predetermined ratio among-on each of the paths, thereby changing the weighting of an amount of

communications to be allocated ~~among-on each of~~ the plurality of paths, according to the occurrence of the congestion and performs packet transfer of data to said another storage system according to the changed predetermined ratio ~~among-on each of the~~ paths,

wherein the control unit has information on the predetermined ratio and a change rate to be applied to the predetermined ratio to compute the changed predetermined ratio when a change in the predetermined ratio is required,

wherein the control unit, when congestion of the plurality of paths has been detected, computes the changed predetermined ratio ~~among-on each of~~ the paths based on the change rate, and

wherein the control unit transfers data to said another storage system using the plurality of paths based on the changed predetermined ratio ~~among~~ on each of the paths.

20. (currently amended) A system comprising:

a first storage device;

a second storage device;

a plurality of paths connected between the first storage device and the second storage device; and

a computer which is connected to the first storage device,

wherein a switch is included in the plurality of paths,

wherein the first storage device transfers data to the second storage device using the plurality of paths at a predetermined ratio defining a ~~weighting-of-an amount of~~ communications to be allocated ~~among-on each of~~

the plurality of paths relative to a total amount of communications on all of the paths so that communication loads among-on each of the plurality of paths are balanced,

wherein the computer detects congestion of a first path among the plurality of paths based on a notification from the switch and notifies the first storage device of a changed predetermined ratio to be used after detection of the congestion,

wherein the first storage device changes the predetermined ratio among paths to the changed predetermined ratio, thereby changing the weighting of an amount of communications to be allocated among-on each of the plurality of paths, based on the changed predetermined ratio from the computer and transfers data to the second storage device using the plurality of paths according to the changed predetermined ratio,

wherein the computer has information on the predetermined ratio and a change rate to be applied to the predetermined ratio to compute the changed predetermined ratio when a change in the predetermined ratio is required,

wherein the computer, when congestion of the plurality of paths has been detected, computes the changed predetermined ratio among-on each of the paths based on the change rate, and sends information on the changed predetermined ratio to the first storage device,

wherein the first storage device transfers data to the second storage device using the plurality of paths based on the changed predetermined ratio among-on each of the paths,

wherein the computer judges recovery from the congestion of the first path and notifies the first storage device of a further changed predetermined ratio, and

wherein the first storage device changes the changed predetermined ratio among paths to the further changed predetermined ratio and transfers data to the second storage device using the plurality of paths according to the further changed predetermined ratio.

21. (currently amended) A storage system comprising:

a control unit;

a disk device which is connected to the control unit; and

an interface which is connected to a network which is connected between said interface of said storage system and of a plurality of other devices,

wherein said network is external of each of said storage system and the other devices,

wherein the interface is connected to the other devices by a plurality of paths in the network,

wherein the control unit sends data stored in the disk device as a packet to the other devices using the plurality of paths at a predetermined ratio defining a weighting of an amount of communications to be allocated among on each of the plurality of paths relative to a total amount of communications on all of the paths so that communication loads among on each of the plurality of paths are balanced,

wherein, in the case in which an acknowledgement for the packet sent to the other devices has not been received for a fixed period, the control unit judges that congestion has occurred in the plurality of paths,

wherein the control unit changes the predetermined ratio ~~among-on~~ each of the paths, thereby changing the ~~weighting of an amount of~~ communications to be allocated ~~among-on~~ each of the plurality of paths, according to the occurrence of the congestion and performs packet transfer of data to the other devices at the changed predetermined ratio ~~among-on~~ each of the paths,

wherein the control unit has information on the predetermined ratio and a change rate to be applied to the predetermined ratio to compute the changed predetermined ratio when a change in the predetermined ratio is required,

wherein the control unit, when congestion of the plurality of paths has been detected, computes the changed predetermined ratio ~~among-on~~ each of the paths based on the change rate, and

wherein the control unit transfers data to the other devices using the plurality of paths based on the changed predetermined ratio ~~among-on~~ each of the paths.

22. (currently amended) A system according to claim 1, wherein said third device when computing the changed predetermined ratio, performs processing for reducing a ratio ~~among-on~~ each of the paths, which is assigned to a path in which congestion has occurred, at a designated change rate and allocates the reduced amounts to the other paths.

23. (currently amended) A system according to claim 22, wherein said third device when computing the changed predetermined ratio includes:

means for, in a case in which a same number of congestion has occurred in all paths being used, and in a case in which all paths are recovered from the congestion, performing a process for returning the changed predetermined ratio among on each of the paths to a default value.

24. (previously presented) A system according to claim 1, wherein said third device when computing the changed predetermined ratio includes:

means for, upon detecting that a congestion has occurred on a path, calculating a ratio being used on the path at the time of congestion and a difference between the ratio at the time of congestion and a ratio set in advance for the path upon which the congestion has occurred and allocating the difference to ratios of the other paths.

25. (new) A system according to claim 1, further comprising:

means for managing ratio a change flag and a ratio change rate by use of a task management table, managing a default ratio and a changed ratio by use of a path management table and updating the predetermined ratio in the path management table in accordance with the change rate in the task management table.

26. (new) A system according to claim 3, further comprising:

means for managing ratio a change flag and a ratio change rate by use of a task management table, managing a default ratio and a changed ratio by use of a path management table and updating the predetermined ratio in the path management table in accordance with the change rate in the task management table.

27. (new) A system according to claim 10, further comprising:

means for managing ratio a change flag and a ratio change rate by use of a task management table, managing a default ratio and a changed ratio by use of a path management table and updating the predetermined ratio in the path management table in accordance with the change rate in the task management table.

28. (new) A system according to claim 12, further comprising:

means for managing ratio a change flag and a ratio change rate by use of a task management table, managing a default ratio and a changed ratio by use of a path management table and updating the predetermined ratio in the path management table in accordance with the change rate in the task management table.

29. (new) A system according to claim 19, further comprising:

means for managing ratio a change flag and a ratio change rate by use of a task management table, managing a default ratio and a changed ratio by use of a path management table and updating the predetermined ratio in the

path management table in accordance with the change rate in the task management table.

30. (new) A system according to claim 20, further comprising:

means for managing ratio a change flag and a ratio change rate by use of a task management table, managing a default ratio and a changed ratio by use of a path management table and updating the predetermined ratio in the path management table in accordance with the change rate in the task management table.

31. (new) A system according to claim 21, further comprising:

means for managing ratio a change flag and a ratio change rate by use of a task management table, managing a default ratio and a changed ratio by use of a path management table and updating the predetermined ratio in the path management table in accordance with the change rate in the task management table.

32. (new) A system according to claim 1, further comprising:

a function for recovering the path using the predetermined ratio for said path.

33. (new) A system according to claim 3, further comprising:

a function for recovering the path using the predetermined ratio for said path.

34. (new) A system according to claim 10, further comprising:
a function for recovering the path using the predetermined ratio for said
path.

35. (new) A system according to claim 12, further comprising:
a function for recovering the path using the predetermined ratio for said
path.

36. (new) A system according to claim 19, further comprising:
a function for recovering the path using the predetermined ratio for said
path.

37. (new) A system according to claim 20, further comprising:
a function for recovering the path using the predetermined ratio for said
path.

38. (new) A system according to claim 21, further comprising:
a function for recovering the path using the predetermined ratio for said
path.